Electronic Supplementary Information

Monodisperse and self-assembled Pt-Cu nanoparticles as an efficient electrocatalyst for methanol oxidation reaction

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Fig. S1. Monodispersed PtCu nanospheres in different scale: (a) 100nm and (b) 20nm.



Fig. S2. TEM images of the $Pt_{68}Cu_{32}NPs(a)$ and $Pt_{38}Cu_{62}NPs(b)$.



Fig. S3. Self-assembled PtCu nanospheres in different scale: (a) 100nm and (b) 10nm. From (b), we can see the particles can be self-assembled well on the edge of the sample.



Fig. S4. TEM images of PtCu/C in 50nm scale (a) and 20nm scale (b). From the images, it was obtained that the PtCu nanoparticles were uniformly dispersed on commercial carbon powder.



Fig. S5. XPS survey spectrum of PtCu/C sample (a), C1s XPS spectra (b) and O1s XPS spectra (c) of the PtCu/C catalysts.



Fig. S6. CVs of MOR on PtCu NPs (blue), PtCu/C (red) and Pt/C (black) at 50 mV/s in 0.5M H_2SO_4 containing 1 M CH₃OH Potential scan rate of 50 mV/s.



Fig. S7. CVs of MOR on $Pt_{68}Cu_{32}$ NPs (black), $Pt_{38}Cu_{62}$ NPs (red), Pt nanoparticles (blue) and Cu (mint green) at 50 mV/s in 0.5M H_2SO_4 containing 1 M CH₃OH. Potential scan rate of 50 mV/s.



Fig. S8. The 1st and the 1,000th cyclic voltammetry curves obtained on PtCu nanoparticles (a), PtCu/C catalyst (c) and the commercial Pt/C catalyst (e) in 0.5 M H_2SO_4 solution. And the 1st and the 1,000th cyclic voltammetry curves obtained on PtCu nanoparticles (b), PtCu/C catalyst (d) and the commercial Pt/C catalyst (f) in 0.5 M H_2SO_4 + 1.0 M CH₃OH solution. Potential scan rate of 50 mV/s.



Fig. S9. TEM images of PtCu/C, (a) the 1st and (b) the 1,000th. We can see after scanning durability, the shape and dispersibility of PtCu nanoparticles on commercial carbon powder are slightly changed, showing good stability.



Fig. S10. TEM images of the commercial Pt/C catalyst, (a) the initial and (b) after 1,000 cycling.

Table S1. Comparison of Pt mass-specific peak current densities of different catalysts for MOR.

Catalyst	j/mAmg ⁻¹ Pt	Ref.	
Stars-like PtCu/rGO	670	1	
Hollow-PtCu/C	889	2	
Nanoporous Pt ₆₀ Cu ₄₀	750	3	
PtCu/C clusters	1200	4	
Pt ₃ Cu icosahedra	736	5	
Pt-Cu/C	1365	6	
PtCu ₂ /rGO	642	7	
PtCu/C nanoparticles	1338	This work	
PtCu nanoparticles	1137	This work	
Commercial Pt/C	480	This work	

Table.S2. the half wave potential of different catalysts:

Catalyst	Pt/C	PtCu/C	PtCu
Half wave			
potential (V)	0.4523	0.4261	0.4089

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